

The Applicant's claimed invention is directed to a perpendicular magnetic recording disk. In particular, and reciting the elements of Claim 1, an exemplary recording disk includes a substrate, a perpendicular magnetic recording layer, an underlayer between the substrate and the perpendicular magnetic recording layer for inducing perpendicular orientation of the perpendicular magnetic recording layer, and an intermediate soft magnetic layer between the underlayer and the perpendicular magnetic recording layer for forming closed magnetic loops together with the perpendicular magnetic recording layer, the perpendicular magnetic recording layer having a thickness in the range where the ratio of perpendicular coercivity H_c to maximum perpendicular coercivity H_0 decreases with reduced thickness of the perpendicular magnetic recording layer.

Hirotaoka discloses a perpendicular magnetic recording medium comprising a chromium film, a soft magnetic film and a perpendicular magnetic film formed sequentially on a substrate (see paragraph 8). However, Hirotaoka fails to disclose or suggest a perpendicular magnetic recording layer having a thickness in the range where (H_c/H_0) decreases with decreasing thickness of the recording layer. Moreover, and referring to Figure 13, Hirotaoka discloses that the medium signal to noise ratio increases as the perpendicular magnetic anisotropy film thickness decreases to 50 nm, but that a perpendicular magnetic anisotropy film having a thickness of 20 nm showed a low medium signal to noise ratio (see paragraph 34). Accordingly, Applicant submits that Hirotaoka, which is directed at *decreasing* medium noises (see abstract) and thereby increasing the signal to noise ratio, *teaches away* from a perpendicular magnetic anisotropy film having a thickness of 20-50 nm, as recited in independent Claim 7 by its indication that 20nm the result is not good.

Applicant has discovered that reduced noise and an improved signal-to-noise ratio can be obtained in pseudo double-layer perpendicular magnetic recording (PMR) disks comprising a PMR layer having a thickness in the range where the ratio of perpendicular coercivity H_c to maximum perpendicular coercivity H_0 decreases with reduced thickness of the perpendicular magnetic recording layer (see specification at page 8, lines 3-29). Thus, Applicant has discovered a design rule that can be used by manufacturers of recording disks to select the thickness of a perpendicular magnetic recording layer in order to minimize the noise level amplified by the layer itself.

Honda discloses high linear density recording using perpendicular media (see abstract). Honda further discloses that the thickness of the medium has a "significant effect on the output" (see abstract), but Honda is completely silent as to the effect of recording media thickness on noise. Applicant submits that Honda fails to remedy the deficiencies of Hirotaka. Specifically, both Hirotaka and Honda fail to disclose or suggest selecting a thickness for a perpendicular magnetic recording layer in a range wherein (H_c/H_0) decreases with decreasing thickness of the recording layer.

The Official Action alleges that one skilled in the art would have been motivated to incorporate the recording density responses of Honda, including the thicknesses of the recording layer recited in Honda, into the perpendicular recording layer of Hirotaka in order to maximize the performance of the media for high density recording in a perpendicular magnetic recording disk, as recited in Claim 1.

Applicant respectfully disagrees.

Honda shows various relationships between recording density response and recording layer thickness. For example, as disclosed by Honda on page 3804, column 2, and in Figures 1 and 4, output increases with increasing thickness at the lower density of 10 kFRPI, but decreases with increasing thickness at the higher density of 300 kFRPI. Honda further discloses that "output is governed mainly by the thickness at a higher density of 300 kFRPI" but that "a simulation result indicated that the output at high densities scarcely depends on medium thickness in the region less than 100 nm" (Hirota at page 3805). Applicant submits that the recording density responses of Honda fail to remedy the deficiencies of Hirota with respect to the Claim 1. Nothing in the disclosure of Honda would motivate one having ordinary skill in the art to select the thickness of a perpendicular magnetic recording layer based on the thickness dependence of the (H_c/H_0) ratio. This criterion is simply not disclosed.

Further, Applicant disagrees with the assertion on page 4 of the Official Action that Honda employs the range of thicknesses for the perpendicular layer preferred by Applicant, as in Claim 10. Claim 10 recites a recording disk wherein the intermediate soft magnetic layer has a thickness of 3-30 nm. Honda does not disclose an intermediate soft magnetic layer, much less any layer having a thickness of 3-30 nm. Withdrawal of the rejection is respectfully requested.

Claims 4 and 8-10 were rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over Hirota, Ullmann's and Honda, in further view of U.S. Patent No. 6,641,934 to Suzuki or U.S. Patent No. 5,942,342 to Hikosaka. The reasons for the rejection are set forth on pages 5-7 of the Official Action. The Official Action alleges that it would have been obvious to use the soft magnetic layer materials and the

perpendicular magnetic layer materials of Suzuki or Hikosaka in the recording media of Hirotaka and Honda. This rejection is respectfully traversed.

Claims 4 and 8-10 depend from Claim 1 and thus are patentable over Hirotaka, Ullmann's, Honda, Suzuki and Hikosaka for at least the same reasons that Claim 1 is patentable over Hirotaka, Ullmann's and Honda. The secondary references do not disclose or suggest, nor are they purported to disclose or suggest teach, the missing teachings as identified above.

It is submitted that the differences between the claimed subject matter and the prior art are such that the claimed subject matter, as a whole, would not have been obvious at the time the invention was made to a person having ordinary skill in the art.

In light of the foregoing, Applicant respectfully requests reconsideration and allowance of the above-captioned application.

Respectfully submitted,

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